De Plantis Toxicariis e Mundo Novo Tropicale Commentationes XXXVI. *Justicia* (Acanthaceae) as a Source of an Hallucinogenic Snuff[1]

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The history of use, botanical identification, and known chemical constituents of Justicia pectoralis (*Acanthaceae*), *one of the South American hallucinogens, are reviewed.*

Justicia (Acanthaceae) como fonte de rapé halucinogênico. *A história do uso, identificação botânica, e constituintes químicos conhecidos de* Justicia pectoralis (*Acanthaceae*), *uma das plantas halucinógenas sul-americanas, são revistos.*

There has long been uncertainty concerning the role played by leaves of the genus *Justicia* in South American hallucinatory preparations—whether merely as additives to snuff-powder made basically from *Virola theiodora* or alone as the source of a psychoactive snuff.

Perhaps the first reference to *Justicia* based on identifiable botanical material as having a role in psychotropic snuffs in South America was published in 1967 (Schultes 1967).

There are numerous references in the literature to the small, herbaceous plant known to the Waikas as *masha-hiri* or a close variant of this name. All the earliest references cited no botanical collections.

What appears to be the first report is that of Barker (1953), a missionary amongst the Venezuelan Waikas, who stated that these Indians had various kinds of *yopo* of different strengths prepared from leaves, bark, and ashes of a bark; the reference to "leaves" may concern *Justicia,* but there is no certainty.

The ethnologist Zerries (1960) indicated that an herbaceous plant was added to the *epena* snuff. The anthropologist Becher (1960) wrote that the Surará and Pakidái, Waika groups in northwestern Brazil, added a cultivated member of the pepper family (Piperaceae) called *maxaraha* to *Virola*-snuff; this "identification" is probably the first attempt at a botanical determination, even though it was not based on specimens of the plant. Seitz (1965, 1967) reported that, in a Waika settlement on the Rio Maturacá in Brazil, "we saw that a third ingredient was added to the preparation of *Virola*-snuff with the ashes of *ama-asita*—later identified as *Elizabetha princeps* [Schultes and Holmstedt 1968]—the little leaves of an herbaceous plant called mashi-hiri, like the *epena* scrapings and powdered. These leaves, however, have no intoxicating effect. The Indians say they are merely aromatic."

Wilbert (1963) stated that the Karimé, culturally and geographically related to the Waikas of the Orinoquia of Venezuela, are said to prepare a snuff from "a small plant called *kokoime.*"

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In his extensive and detailed studies of the Waika, Zerries (1960, 1964) did not mention any plant that might be *Justicia,* but he did note Salathé's description of an unidentified plant of weak growth, called by the Karimé Indians *kokoime*; it is, he reported, "without a stem" and occurs in cultivated plots; the leaves are dried and powdered and used as a narcotic (Salathé 1932). This plant could be a *Justicia.*

Wassén (1966) reported that the Indians of the upper Orinoco prepare their *yopo* from three plants: *hisioma* (*Anadenanthera peregrina*), *masho-hara* (said to be a piperaceous species), and *bolek-hena* (a powder called "leaves of the spirit of death").

In 1966, Biocca mentioned that *masci-hiri* is "an aromatic herbaceous plant" employed merely as an addition to the *Virola*-snuff amongst the Waikas.

Schultes (1967) reported the possible use of *Justicia* as an hallucinogen amongst Venezuelan Indians:

> A number of years ago, a missionary working in the headwaters of the Orinoco in Venezuela handed me a partially rotted, matted roll of plant material which he said was the source of one of the narcotic snuffs of the Waika Indians. The condition of the material was very poor, but it seemed to represent a species of *Justicia.* This identification was tentatively corroborated by Dr. E. C. Leonard . . . I have never been able to visit this region to investigate the problem personally. With our unsatisfactory preservation of the material and the failure of other botanists who have visited the general region to report it . . . I more or less dismissed *Justicia* as a serious contender for inclusion in our list of hallucinogens. I am now, however, convinced that this problem must be investigated in the field, for recently, the Brazilian botanist, Prof. João Murça Pires, informed me personally that the Waikas do indeed employ a species of *Justicia,* a species close apparently to *Justicia pectoralis* [Fig. 1] in the preparation of a vision-producing snuff.

In 1968, Schultes and Holmstedt reported their ethnopharmacological study on the hallucinogens used in a Waika settlement (Wayhana-oo-thle) on the Rio Tototobí in the Territorio do Roraima, Brazil. They found these Waikas toasting the leaves of a *Justicia,* pulverizing them and adding the powder to the fine dust of the dried resin-like bark-exudate of *Virola theiodora.* These Indians know the plant as *masha-hara-hanak* (*hanak* meaning "leaf"); they also call the plant *boo-hanak.* They wrote that, when the natives dry and pulverize this dried exudate,

> a powder of the leaves of a plant called *mashi-hiri* is prepared. This . . . herb, cultivated in dense patches near the edge of the village [Fig. 2], is the acanthaceous *Justicia pectoralis* var. *stenophylla* [Fig. 3]. It is kept hanging in bunches from the house-beams [Fig. 4] and is, consequently, usually quite dry when needed. The whole plant is crushed between the hands, the powder is sifted to remove bits of the stem and other refuse [Fig. 5], and the resulting fine greenish dust is added to an equal amount of the brown *Virola*-powder. The *Justicia* plant is pleasingly aromatic as it hangs drying, and the prepared powder is even more highly aromatic. The natives assert that it is added to improve the smell of the final epena snuff (*Virola*) and that it is not active. While it is true that other groups of Waika prepare a potent *Virola*-snuff without the *Justicia,* preliminary chemical investigation . . . suggests that we may be unwarranted in assuming that it is an ingredient wholly devoid of pharmacological activity."

These preliminary chemical analyses indicated such a very minor concentration of tryptamines that Schultes and Holmstedt felt that perhaps, since they had handled the material of *Justicia* without washing their hands following the handling of the heavily tryptamine-bearing *Virola* specimens, they unwittingly had contaminated the specimens of *Justicia.*

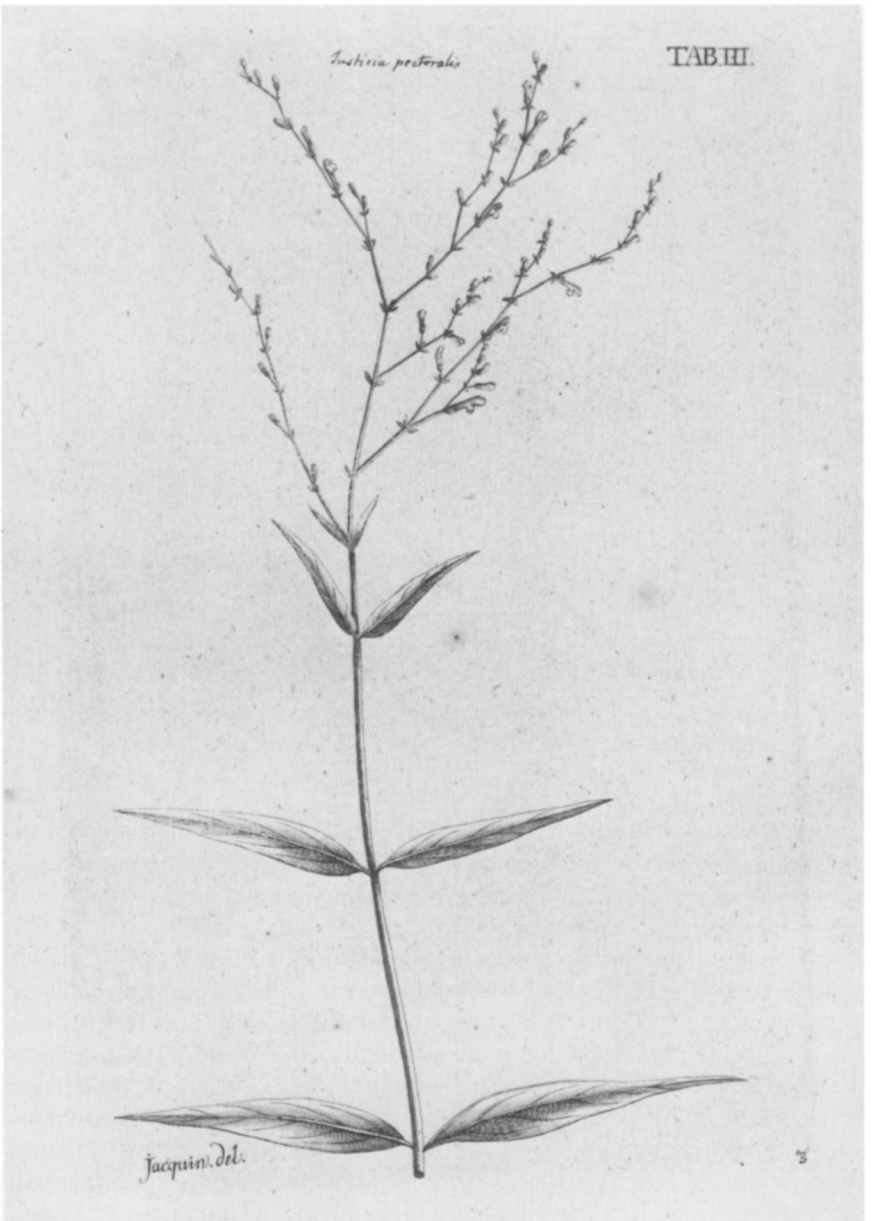

Fig. 1. *Justicia pectoralis.* Drawing published by Jacquin when he described the species.

This report apparently is the first that is based on identifiable botanical material and the earliest suggestion that tryptamines might be present in the species.

The American anthropologist Chagnon studied many Waika settlements in depth. In his book *Yanomamo, the Fierce People,* he did not mention *Justicia* in the first two editions (Chagnon 1968, 1977). In edition 3 of the book, however,

Fig. 2. Cultivation of *Justicia pectoralis* var. *stenophylla*. Waika Indian settlement of Majecototerí, Platanál, Venezuela. Photograph by B. Pflüger.

he reported, after mentioning *yakowana* (*Virola*) and *hisiomo* (*Anadenanthera*), that "several other plants are used to make hallucinogens: the Yanomamo cultivate a variety of small bushes of the genus *Justicia* and snuff these, but they are less potent and less desirable than the other two" (Chagnon 1983).

In two remarkably valuable papers by Chagnon, LeQuesne, and Cook (1970, 1971), dedicated to anthropological, botanical, and chemical findings concerning Waika hallucinogens, there was mention of a number of collections of different "types" of *Justicia* that were being grown at the Michigan Botanical Gardens under controlled conditions and were being identified at the Smithsonian Institution by a specialist on Acanthaceae, D. Wasshausen. Notes on the various Waika terms for the several hallucinogenic plants are given. It was definitely stated in these papers that *Justicia* is not merely an aromatic additive to snuff from *Virola* but that it is used by itself to prepare snuff for inducing intoxication. They pointed out that the term *ebene* refers to all hallucinogenic snuffs.

In connection with preparing this paper, I was interested in locating the voucher specimens of the numerous "types." Chagnon et al. (1971) had stated that "four of these specimens . . . were regarded as distinct entities by the present Yanomamo cultivators" and that two other *Justicia* specimens seemed to be different. "Pending confirmatory identification by Wasshausen, we tentatively classify all specimens (except the *sua-ka-henako* ["('leaves used on women') is used only as a magical aphrodisiac"] which has a distinct habit and leaf morphology and is best

Fig. 3. *Justicia pectoralis* var. *stenophylla.*

considered a distinct species) as different forms of *Justicia pectoralis* or possibly as different forms of *J. pectoralis* var. *stenophylla* . . ."

I made a search for the voucher specimens and found them in the possession of Dr. Wasshausen, who kindly gave them to the Economic Herbarium of Oakes Ames in the Botanical Museum of Harvard University. Several represent *J. pectoralis* and several have been identified as its variety *stenophylla.*

The phytochemist LeQuesne, in a letter to Holmstedt dated 1 Nov 1977, stated: "I also recall that you were interested in the constituents of *Justicia* species, which are also components of Yanomamo hallucinogenic preparations . . . We investi-

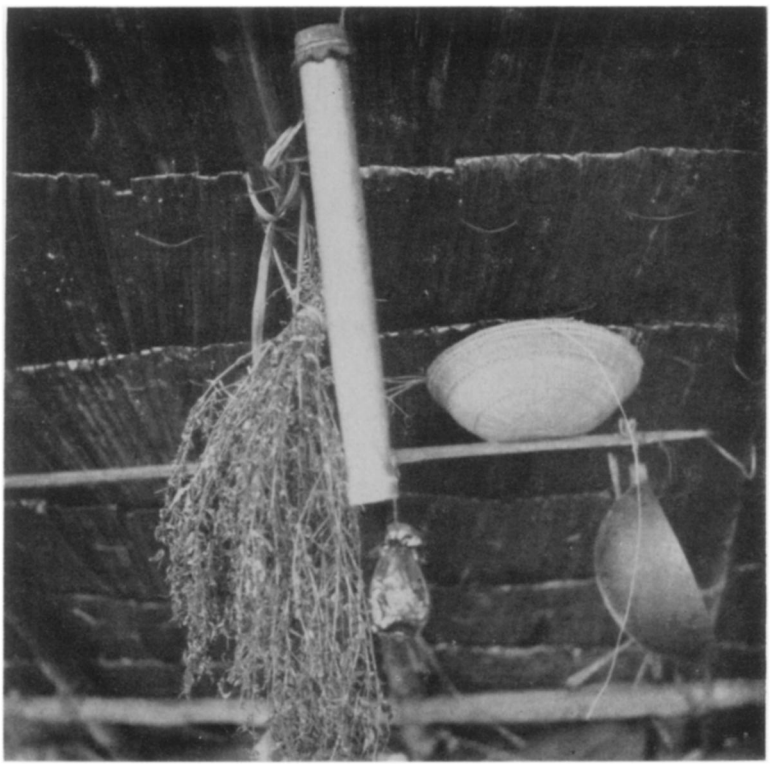

Fig. 4. *Justicia pectoralis* var. *stenophylla* hanging to dry, together with a bamboo tube of *Virola*-snuff and the woven basket used to sift the prepared snuff. Amongst the Waika Indians, Maturacá, Rio Cauaburí, Brazil. Photograph by R. E. Schultes.

gated some *J. pectoralis* grown in the University of Michigan Botanical Gardens, but apart from indications of the presence of small amounts of vasicine, we did not find anything." In another letter to Holmstedt, dated 5 Feb 1971, LeQuesne wrote: "Vasicine has been reported from related plants, but the main recent work I am aware of on *Justicia* species has been on piscicidal lignans. It seems possible, if the effect of the plants on the Yanomamo is really that of psychoactive drugs, that there could be non-nitrogenous psychoactive compounds present."

LeQuesne has recently informed me (pers. comm. 1987) that he found in the very scant material available trace amounts of tryptamines. This observation coincides with the results of Holmstedt's earlier finding of limited concentrations of tryptamines in *J. pectoralis* var. *stenophylla.* If indeed tryptamines be present in *Justicia* in small amounts, it might explain why the Waikas consistently state that *Justicia*-snuff is not so potent as that made from *Virola* or *Anadenanthera.*

The botanist Prance (1972) reported that in two of six Waika settlements visited in the Territorio do Roraima in northern Brazil, the leaves of *J. pectoralis* were frequently dried and added to *Virola*-based snuff apparently "for aromatic purposes rather than as an active ingredient." The vegetal material of *Virola* and *Justicia* analyzed by Holmstedt was found to have an active hallucinogenic ingredient only in the *Virola.*

Fig. 5. Waika Indians picking out stem material from *Justicia pectoralis* var. *stenophylla* prior to powdering the leaves for use in *Virola*-snuff. Rio Tototobí, Roraima, Brazil. Photograph by R. E. Schultes.

In 1976 and 1985, Lizot wrote: "To the usual substance—bark and seeds—they now add cultivated plants of the genus *Justicia,* which are psychedelic and aromatic."

Carias-Brewer and Steyermark (1976) reported that the Waika of the Río Cauaburí in Brazil used *J. pectoralis*—*mashi-hiri*—alone and as an admixture to the *Virola*-snuff. According to these investigators, "the leaves of this plant . . . can be used alone, but most of the time it serves rather to strengthen the more powerful epena [*Virola*] snuff powder." They further stated that the term *epena* referred to both snuffs—that made from *Virola* and that made from *Justicia*—and that it seemed to be a general term for intoxicating snuffs. Although they illustrated a dried specimen of *J. pectoralis* collected by other botanists in Venezuela, they failed to cite a voucher specimen for their undoubtedly correct identification of *mashi-hiri.*

The phytochemists Macrae and Towers (1984) published a detailed paper on their chemical study of *J. pectoralis.* The vouchered botanical material, collected in the Peruvian Amazonia, was propagated vegetatively in greenhouse conditions in Vancouver. Extracts of the propagated material contained no alkaloids but did contain widely occurring betaine; betaine, of course, is not known to be psychoactive. These investigators pointed out that, in mice, the extracts had no physiologically noticeable effect such as tryptamines would cause. They likewise found coumarine and umbelliferone, both widespread in plants, in the *Justicia,*

but the effects of the intoxification induced, according to numerous observers, following the use of *Justicia*-snuff, could not be explained by these two constituents; they found, furthermore, that there were no synergistic effects due to extracts of *Justicia.* Their experiments have concluded that "the *J. pectoralis* extracts do not contain any constituent with a pharmacological activity . . . comparable to that of the tryptamine hallucinogens."

Coumarin is the constituent responsible for the aromatic fragrance of dried leaves of *J. pectoralis,* one of the reasons for its use as an admixture with the powder from the *Virola* exudate.

Macrae and Towers suggested, however, that "the contribution of these varied biological activities to the overall effect of the . . . snuff is not clear. The sedative and hypnotic activity observed for coumarin is interesting in this respect . . . The ability of scopoletin to reduce blood pressure . . . is also of interest. Tryptamine administration is often accompanied by transient increases in blood pressure . . . The possibility that coumarin or umbelliferone could lower blood pressure and thereby reduce one of the stressful aspects of the tryptamines is intriguing." But they concluded that they found no evidence "to support the belief that *Justicia pectoralis* is an hallucinogenic plant. Nor does it appear to directly affect the behavioural effects of 5-MeODMT."

Despite the failure to find hallucinogenic compounds in the snuff prepared from the leaves of *J. pectoralis,* there is now no doubt that an hallucinogenic snuff is prepared from these leaves with no other plant material; this fact is attested by numerous observations and reports by anthropologists and botanists who have been engaged in field work with the Waikas.

In the same year, Prance indicated to De Smet (1985a) that he observed the Waikas of the Rio Tototobí taking *Justicia* snuff without *Virola* and that "after the shaman took this, he was apparently in a trance."

In November 1986 Henrik Blohm and Schultes visited the Waika settlement near Platanal in southern Venezuela. There they found three plants employed in the preparation of intoxicating snuffs: *Virola* sp. (bark sample); *Anadenanthera peregrina* (sterile specimen, *Schultes et Blohm s.n.,* ECON, VEN) and *J. pectoralis* var. *stenophylla* (sterile specimen, *Schultes et Blohm s.n.,* ECON, *s.n.*). The names used for these three snuff-preparations are, respectively, *epena, yatowanaa,* and *machohara.* Repeated questioning of two knowledgeable Waikas revealed that the *Justicia,* cultivated in a banana-plot near the settlement, was used as an admixture not only to strengthen the *Virola*-snuff, but that it was also employed alone as the source of an hallucinogenic snuff. It was said to be "weaker" when used alone than either the *Virola* or the *Anadenanthera* snuffs.

Slightly toxic compounds appear to be rather widespread in the Acanthaceae; vasicine has been reported in one species of *Justicia* and 0.1% of a very bitter alkaloid from another (Hegnauer 1964). The apparent discovery by Holmstedt of small amounts of tryptamines in *J. pectoralis* and a similar finding by LeQuesne for the same species together with Hegnauer's report of alkaloids in two different species suggest that an in-depth phytochemical study of *Justicia,* especially of *J. pectoralis,* is long overdue.

There is a further point concerning *Justicia* that may here be relevant. A botanical collection from the Río Apaporis area of Colombia (*Schultes et Cabrera 15244,* COL) bears an annotation that the Puinave name of the plant is *ya-ko-*

yoó; the Puinaves call the *Virola*-snuff *yá-kee*; could this similarity of terms possibly indicate some connection between *J. pectoralis* var. *stenophylla* and *Virola*-snuff amongst these Indians?

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Note

Society for Economic Botany 41st Annual Meeting

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